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Research & Strategy Insights

How governments can respond to the COVID-19 debt surge

A theoretic overview of debt and the possible measures to reduce it

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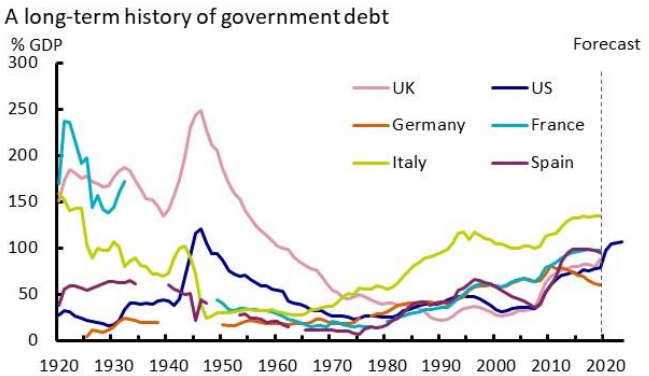
Key points

- Government debt levels have surged to levels not seen for more than 50 years in the wake of the pandemic
- Government debt does not face the same constraints as households and businesses, reducing incentives for debt reduction. With interest rates subdued, debt should fall as a proportion of GDP over the coming years
- However, with debt now at elevated levels, governments may face rising growth headwinds, questions over fiscal space, and in the extreme, sustainability issues
- We present measures to assess government debt levels. We conclude that governments have scope to provide ongoing fiscal support to the current macroeconomic shock. But most governments will need to undertake protracted measures to reduce debt once the recovery is underway.
- We also analyse the tools governments can use to reduce indebtedness. We conclude that the more imaginative ways of eroding debt are unlikely to be as effective as they were in the last century. Accordingly, we expect the process of debt reduction to ultimately be conducted by fiscal consolidation, over a period of decades

COVID-19 takes government debt to old highs

The re-emergence of coronavirus in key areas of the globe has resulted in additional government-imposed restrictions and accompanying extensions of fiscal supports. This will add to the material deterioration in government finances across the world (Exhibit 1). Debt levels over the coming years are likely to rise back to the highs seen after World War II. This will refocus market attention on what amounts of debt governments can sustain, and how it can ever be repaid. In a series of research notes we hope to start addressing these questions.

Exhibit 1: Debt rises towards historically elevated levels



Source: CBO, Office for Budget Responsibility (OBR), International Monetary Fund (IMF), Trading Economics and AXA IM Research, Sept 2020

In this note, we look at the fundamentals of government debt, taking some key examples of debt metrics from the US and other large international economies. Firstly, we will establish why governments are likely to want to reduce their debt levels in the future and we will then outline the key levers they can use to achieve this outcome.

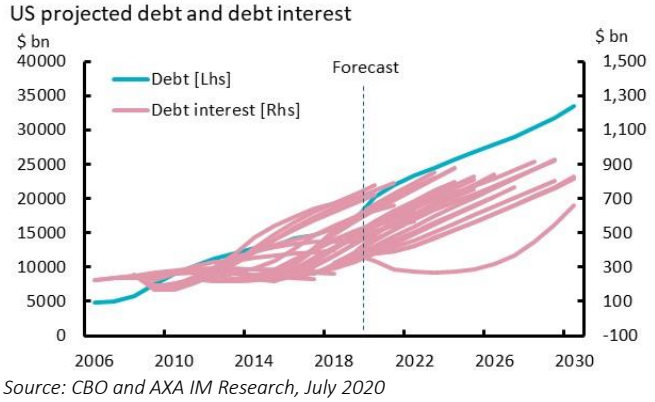
We will publish two companion papers over the coming weeks. The first will take a more detailed assessment of the specific debt levels and vulnerabilities in key developed markets. The second will review the situation in key emerging markets, highlighting the most interesting developments in government debt across the many developing economies.

Debt affordability and the paradox of thrift

Despite high levels of government debt, the requirement for administrations to reduce debt should not be taken as obvious.

Notwithstanding the significant increase in government indebtedness over the last 15 years, debt interest levels have failed to rise as predicted, thanks to falling interest rates, which have made higher debt levels more affordable. Exhibit 2 illustrates the rise in US debt with the evolution of the Congressional Budget Office's (CBO) outlook for debt interest payments. These forecasts have shifted continually lower, even as the debt stock has risen, as rates have fallen. Moreover, low levels of interest rates – crucially below the pace of nominal GDP growth – allows the debt stock to shrink as a proportion of GDP over time. At current interest rate levels, there is no urgency for governments to reduce debt. However, rates are unlikely to fall further, and there is always a risk that they rise again.

Exhibit 2: Debt interest outlook improves as debt rises



Source: CBO and AXA IM Research, July 2020

More generally, government debt should not be seen through the same lens as household or corporate debt. Government spending and revenues are not strictly independent of each other in the same way as household or corporate incomes are. An increase in government spending will lift general economic activity and boost tax revenues, ameliorating or in some cases more than compensating for increased borrowing. The reverse is also true where cuts in government spending do not necessarily translate to budget consolidation as tax revenues are also reduced. The impact of government spending depends on fiscal multipliers, which tend to fluctuate across the economic cycle.

Elevated debt requires remedial action

Despite these mitigating factors, there are still a number of reasons why governments will likely need to reduce debt.

The first is to ensure ongoing affordability and fiscal sustainability. Despite low interest rates making debt affordable now, there is a risk that they rise over the medium term. This could tip a country beyond the point of affordability where debt interest payments add to the burden of financing and deficits begin a path of exponential growth. In addition, financial markets tend to be wary of such developments and an individual government's cost of financing can begin to rise long before finances become technically unstable, exacerbating fiscal strains and precipitating fiscal crises. Governments will want to repair their finances long before such a point is reached.

Even before governments reach such a fiscal event horizon, they will want to reduce debt, to ensure sufficient fiscal space for future unanticipated developments. This is particularly the case with most advanced economies facing the prospect of long-term deterioration in the public finances associated with ageing populations. Here the coronavirus has had a double impact – it has raised government debt levels closer to fiscal sustainability limits, but it has also increased expectations of how quickly finances can deteriorate and the associated size of fiscal buffers required. The CBO forecasts an increase in debt of 27 percentage points (ppt) of GDP from 2019 levels over the next five years.

On top of this, governments may be wary of high levels of debt weighing on the performance of the economy. Economic theory considers higher government spending 'crowding out' private sector spending through higher interest rates. This has clearly not been the case over the last decade or beyond. However, some academic work noted the correlation between highly indebted public sectors and slower overall economic performance[1]; governments may still wish to reduce levels of indebtedness to raise growth rates. We would stress that academic evidence for this is at best mixed, although several governments cited such studies in justifying fiscal consolidation at the start of the last decade.

[1] Rogoff and Reinhart, "Growth in a Time of Debt", American Economic Review, 2010 claimed that 90% debt to GDP was a tipping point for materially lower growth. This paper has been rejected by several other studies, including Herndon, Ash and Pollin "Does High Public Debt Consistently Stifle Economic Growth", LSE, 2013. But other work, including Baum, Checherita-Westphal and Rother, "Debt and growth: New evidence for the euro area", Journal of International Money and Finances, 2013 add to the views that higher indebted countries face slower growth without such a specific tipping point.

Finally, governments may face societal concerns about debt levels and worries about intragenerational fairness, as consumption by current generations will need to be shouldered by the next. In practice, however, ageing societies have imposed few such concerns on their governments to date, with several electing tax-cutting governments in recent decades.

Simplified debt metrics

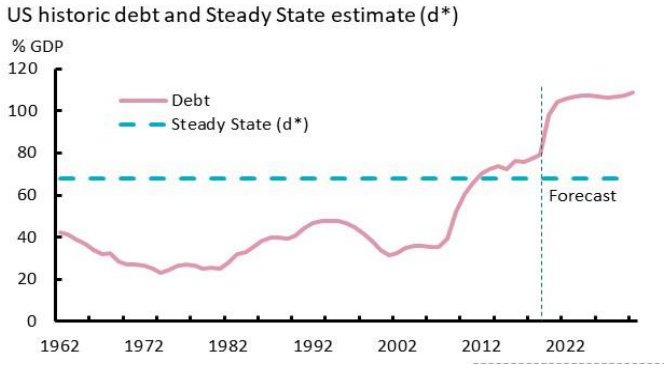
Appendix A contains a relatively simple mathematical approach to deriving key metrics of government debt[2]. These serve to concisely illustrate the problems associated with defining precise trigger points for government debt instability. The following presents the key takeaways from these derivations and can be read from a standalone perspective.

1. Current debt levels are a function of all future deficits, as well as future interest rates and growth rates. Equivalently, at some stage primary deficits must be offset by the present value of primary surpluses

This is relatively self-explanatory and intuitive but makes assessing debt limits difficult, as it requires forecasts of all future primary balances, interest and growth rates.

2. A steady state debt level, d*, can be estimated

Exhibit 3: Estimated steady state debt level



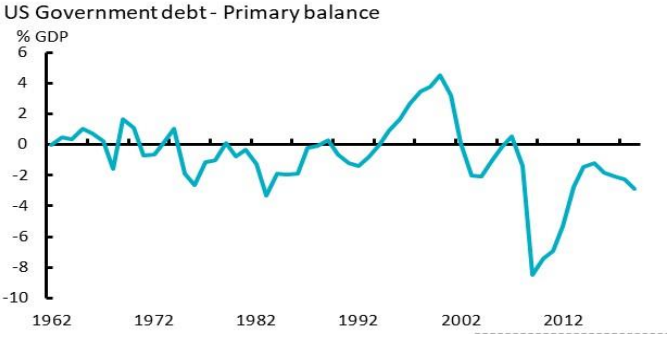
Source: CBO and AXA IM Research, July 2020

Exhibit 3 illustrates the estimated steady state debt level for the US, from 1962 to 2019. However, the steady state is crucially a function of the government's (remedial) reaction to the debt level. Estimated over the period 1962 to 2019, the government has on average raised the primary balance in response to a deteriorating debt outlook, returning debt towards its steady state. However, for it to be a guide to the future, it relies on the strong assumption that future governments will continue to act as previous ones. This need not necessarily be so. Moreover, looking at the sub-period, a (statistically less robust) estimate for 2000 to 2019 suggests a steady state debt level of 87% of GDP.

3. A debt limit only applies if there is an expected limit to future primary surpluses. This may be described as a point of fiscal fatigue

Clearly, we do not know what future primary surpluses could be sustained in the longer run. History may provide some guide (Exhibit 4). In the late 1990s, fiscal consolidation and strong growth combined to deliver a series of primary surpluses in the US peaking at 4.5% of GDP in 2000 but averaging 3.5% in the five years between 1997 and 2001. This was followed by recession in the early 2000s, but this also saw a new government elected on a tax-cutting manifesto. This appears to have been a point of fiscal fatigue and provides some basis for estimating a future limit. Other countries have seen different peaks over recent decades, including the UK which recorded primary surpluses averaging 6.5% between 1948 and 1951, but in more recent decades has seen an average peak around 2.5%, France which has seen a peak average surplus of around 1.5% and Germany which has seen a primary surplus average 2.5% in 9 of the last 13 years. These may also serve as broad guides, although we believe different tolerances to tax and spending occur across different societies, which can make cross country comparisons problematic.

Exhibit 4: Recent history of US primary balances



Source: CBO and AXA IM Research, July 2020

Can we define a debt limit? The importance of r-g

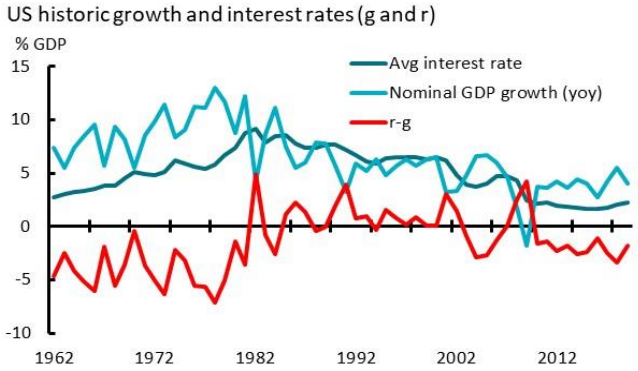
A debt limit is therefore a function of the future path of primary balances, which is affected by the difference between the GDP growth, 'g', and the interest paid on the public debt, 'r'. This is intuitive – the debt stock grows from period to period by the interest rate, but shrinks as a proportion of GDP, by the pace of economic growth. If r > g, the debt stock will rise, and primary surpluses will be required to stop its continual growth over time. Hence the size of the debt stock is limited by the annual rise in the debt stock being no more than the maximum sustainable primary surplus before fiscal fatigue kicks in. And the scale of this annual rise is determined by the difference between r and g.

[2] We summarise from Debrum, X., Ostry, J.D., Willems, T. and Wyplosz, C., "Public Debt Sustainability", Chapter 4 in "Sovereign Debt: A Guide for Economists and Practitioners", IMF, 2018. With special thanks for additional guidance from Tim Willems.

This is important for current conditions. Currently the growth rate exceeds the interest rate. This means the reverse of the above is true, the debt stock will fall over time and governments can afford to run primary deficits up to the size of the decline generated by r-g and not see the debt stock rise. With public deficits likely to reach double digits in many economies in 2020-2021, the debt stock will rise. But with interest rates expected to stay low, relative to growth over coming years, the debt stock should naturally shrink.

Exhibit 5 illustrates the recent history of US rates of growth and interest rates and provides a cautionary tale. While growth rates currently exceed interest, that is a reasonably recent phenomenon. Since the liberalisation of capital markets at the start of the 1980s, interest rates have exceeded growth rates – something that is consistent with economic theory for the long run. Admittedly in the US this has not been by much. Based on our assessment of fiscal fatigue at 3.5%, the historic growth interest differential average between 1985 and 2009 would suggest debt of around 500% of GDP could still have been sustainable. However, over this time the US has additionally benefited from the "exorbitant privilege" – according to former President of France, Valéry Giscard d'Estaing - of being a reserve currency, depressing US interest rates relative to growth. Similar assessments for other major international economies without reserve currency status suggest lower limits, including 312% in Germany, 242% in Japan, 113% in the UK and 92% in France.

Exhibit 5: Periods where growth rates have exceeded interest rates



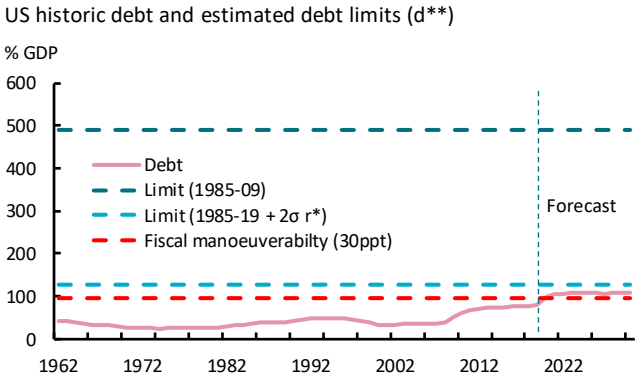
Source: BEA, CBO and AXA IM Research, July 2020

However, defining a 'debt limit' – a fiscal event horizon beyond which finances can spiral out of control – is a much more slippery concept. The first reason for this is that interest rates can rise – we do not mean variation in central bank policy rates, but longer-term global rates. Exhibit 6 illustrates how the 'debt limit' changes if the natural rate of interest in the US were to rise by two standard deviations, around 3ppt, back to the average level of the 1980s. With no associated improvement in nominal growth, the US limit would fall back to 125% of GDP. A two standard deviation shock to the interest rate can be considered extreme for an economy like the US not recording faster growth. However, this is particularly relevant for the vast majority of countries whose economies do not significantly influence global interest rates and which could thus see rates rise exogenously, depending on the activity in larger international economies.

Governments will also want to maintain fiscal space allowing room for future fiscal support in the wake of unforeseen events. In this case, the pandemic has had a double impact on the assessment of fiscal sustainability. First it has pushed debt levels higher, bringing them closer to levels of sustainability. Second, the size of the fiscal impact will raise concerns about the size of possible future deteriorations. With the US CBO now estimating a rise in debt of 30ppt of GDP over five years in response to the pandemic, markets may conclude that a safe 'limit' is closer to 95% of GDP – now below the current estimated level of US debt to GDP, which is a reason to consider the need for the US authorities to reduce indebtedness over the medium to longer term.

To complicate matters, governments are also vulnerable to short-term fluctuations in funding rates, which reflect amongst other things investors' confidence. Such financing crises tend to be short-term, as opposed to long-term shifts in global rates driven by structural factors. However, they can be persistent enough to make otherwise sound finances unsustainable. For example, if US debt had risen towards 500% in the 1980s, we doubt the country would have retained the low interest rate levels associated with its reserve currency status, which in turn would have reduced its sustainable funding limit.

Exhibit 6: Impact of 2 standard deviation rise in r*

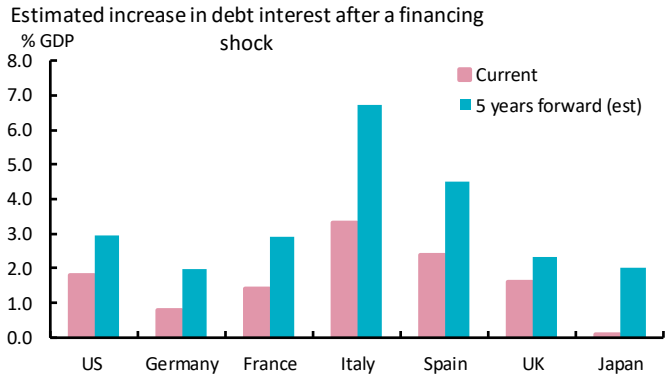


Source: CBO and AXA IM Research, July 2020

Financing shocks can have many different causes, but also account for institutional differences in government funding markets. To illustrate this, we also consider a short-term financing shock, by considering a two standard deviation increase in government bond yields. The impact that this has on government finances is also a function of the duration of the government debt portfolio, which determines how quickly governments must refinance outstanding debt at

higher interest rates. Exhibit 7 illustrates the estimated additional increase in debt interest in five years' time based on a two standard deviation yield increase.

Exhibit 7: Estimated increase in debt interest from a financing shock



Source: CBO, OBR, Eurostat, MoF, Refinitiv and AXA IM Research, Sept 2020

Low rates give governments time to react

Although we have illustrated some key concepts in assessing fiscal sustainability, material uncertainty surrounding precise levels of fiscal fatigue, future growth and interest rates (and their interrelatedness) and investor perceptions and confidence all lead to meaningful variation in the precise levels of debt that governments can sustain (Exhibit 6). We concur with CBO Director Philip Swagel's recent comments[3] that "there is no set tipping point at which a fiscal crisis becomes likely or imminent, nor is there an identifiable point at which interest costs as a percentage of GDP become unsustainable – but as the debt grows, the risks become greater".

Our conclusion is that with interest rates subdued and our forecasts likely to remain so too, for the foreseeable future, governments face no pressing urgency to reduce levels of debt. This should allow each of the large international economies time to provide ongoing fiscal support to fragile economies in the early phases of recovery. However, over the longer term – and as the recovery broadens and matures – we would expect governments to embark on a protracted process of reducing debt. We anticipate they will lower levels definitively below limits of sustainability to ensure fiscal space for future policy action and ensure a buffer against the risk of a financing shock. We will now look at how governments can achieve this.

How governments can lower their debt levels

Below is a brief summary of the tools and measures that governments can use to reduce debt levels. We will investigate most of these policies in more detail. However, we are considering how governments reduce debt without repudiating it, so we do not consider the complex world of default and restructuring. We will not look at privatisation or asset sales as a way of reducing debt. In simplistic terms, an asset sale is a transfer of assets i.e. a physical asset for cash. And while asset sales can alleviate cash shortages, and can be useful in financing crises, they do not reduce net debt, unless there is an expectation that productivity enhancements can be made under alternative ownership that makes the asset more valuable (and so the sale price is higher) than it is worth on the government balance sheet.

Fiscal authorities

- Fiscal consolidation/austerity
- Growth enhancing policies
- Short-term growth boost
- Privatisation
- Restructuring/default

Monetary authorities

- Inflation (FX adjustment)
- Seignorage
- Financial Repression

The fiscal authorities' toolkit

Fiscal consolidation is intuitively the simplest method for governments to reduce debt. This simply means governments should cut spending and/or increase tax revenues to create a (larger) primary surplus. This relatively simple approach, dubbed "austerity", has attracted much criticism in recent years. This moniker is as much a result of governments leaning on spending cuts, over tax increases, to adjust primary balances. This followed a range of academic literature[4] asserting that spending cuts could generate growth enhancing budget consolidation, reflecting several successful debt consolidation programmes in the 1980s (Austria) and 1990s (Sweden and Canada) that did carry out significant and long-lasting consolidation through spending cuts.

In hindsight, the focus on spending cuts should be questioned. The number of successful cases where this took place were hardly statistically significant. They also took place against a broadly more supportive economic backdrop – the Canadian consolidation occurring as the US, a key trade partner adding strong export demand – grew strongly. A similar dynamic supported the Swedish consolidation as European countries thrived in anticipation of the Economic and Monetary Union (EMU). Reductions in government spending in a period of weak economic growth, and while other countries conducted similar policies, were not so successful.

[3] 21 Sept 2020

[4] For example, Alesina, A., Favero, C. A. and Giavazzi, F., "Austerity: When it Works and When it Doesn't", 2019

This reflects a basic view that government spending multipliers vary across the cycle. In the wake of a downturn, where there is a lot of spare capacity and private spending is subdued, fiscal multipliers are large. Governments can spend, and this can have a large impact on economic growth, as it does not generate other inflationary pressures and crowd out private spending. Later in the cycle, additional spending increases can remove spare capacity, create inflationary pressure and result in interest rate rises, which does crowd out private spending. This was in part why US President Donald Trump's Tax Cuts and Jobs Act 2018 had such little impact on overall economic growth. The logic of this is that fiscal stimulus is appropriate while levels of activity are still subdued, and consolidation appropriate later in the cycle. Equally that spending cuts while activity is subdued could prove self-defeating as they depress growth by as much as they reduce the primary balance.

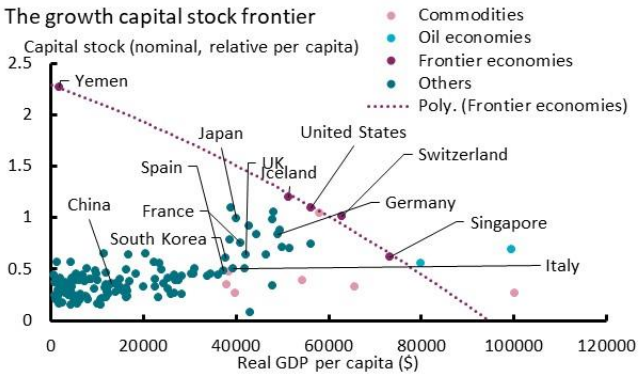
Governments can also reduce debt as a proportion of GDP by delivering growth-enhancing policies. Such policies will include short-run boosts to aggregate demand to prevent short-term growth declines leading to longer-term supply shocks, for example including hysteresis effects associated with long-term unemployment. The positive impact from growth is all the stronger when we consider that the primary surplus itself is also a function of the underlying growth rate. In the short term, the primary surplus can be enhanced by faster growth which tends to drive government revenues, where government spending typically follows changes in general price levels[5].

More powerfully, governments can undertake longer-term investment spending that will help drive productivity growth and potential GDP higher. This type of spending can include interconnectivity infrastructure – for example transport links and broadband connectivity, research and design, or human capital investment, including in education or skills re-training. It may also include investment to address inequality and social mobility.

This strategy of reducing debt with faster long-term growth is clearly the most attractive option for governments. However, some countries have more scope to deliver long-term growth improvements than others. Exhibit 8 illustrates a traditional technological frontier chart, plotting countries' capital stock – using the US as a numeraire – against per capita GDP. Countries on the frontier can only deliver faster growth with even greater total factor productivity growth – a product of investment and innovation. However, those countries that lie behind the frontier can in theory 'catch up' by adopting the best practices of frontier economies. For those further behind the frontier, the scope for catch up is greater. By definition, most developed economies have limited scope for catch up.

[5] Mauro, P., and Zilinsky, J., "Reducing Government Debt Ratios in an Era of Low Growth", Peterson Institute for International Economics, Jul 2016.

Exhibit 8: Gauging the scope for long-term trend growth improvement



Source: Penn World and AXA IM Research, Sept 2020

The monetary authorities' toolkit

Other levers that have been used to reduce debt burdens in the past are in the main under the control of the monetary authorities. In the wake of the coronavirus, and with central banks once again enacting policy stimulus through balance sheet expansion, speculation has grown that these tools could again be used to reduce indebtedness.

Inflation

One key concern is that authorities will use inflation to shrink debt, boosting the nominal rather than real component of GDP growth, to lower the debt ratio. This was a key feature of the post-World War II debt reduction campaign. However, precisely because of its recent role, this is not as easy as it seems.

A government has to have a relatively high-duration debt portfolio to be able to significantly deflate away its debt. This is because markets are wise to this outlook and nominal interest rates include an inflation expectations component. If governments suddenly created high inflation, expectations for future inflation would rise, in turn driving the interest rates and the cost of financing the debt higher. As we illustrated in the financing shock debate, a higher portfolio maturity insulates the borrower from changes in the interest rate for longer and so would allow higher inflation to erode proportionately more of the debt stock before debt interest rates rose further.

Moreover, markets have been aware of this inflation risk and have charged risk premia accordingly. To avoid paying excessive risk premia, governments have adopted time consistent policies to reassure markets that they will not inflate the debt away. These policies have included in some cases borrowing in foreign currency, for example US dollars and euros, where the borrower cannot influence the inflation rate. Or more

specifically, issuing inflation-linked bonds, where payments are directly linked to inflation. Countries which have high levels of foreign-denominated debt or inflation-linked exposure by design see limited advantage to high inflation.

Finally, even if government debt portfolios could be reduced by faster inflation, domestic central banks may not control inflation. This is the case if the country is part of a monetary union, for example EMU or West African Economic and Monetary Union, where central monetary authorities are typically tasked with an inflation target. But even unencumbered domestic central banks have struggled to exert meaningful influence over inflation in recent decades, the extreme case being the Bank of Japan. At the start of 2013, it raised its inflation target to 2% in line with other international central banks. Since that time headline inflation has averaged just 0.4% and it currently stands at 0.2%, with the 'core' measure at -0.4%.

Seignorage

Another monetary policy tool that has seen a revival in interest recently is seignorage, or printing money. This refers to the central banks' ability to create money and has a proud history of many of the more spectacular collapses in financial systems through the creation of hyperinflation, both in 1920s Weimar Germany and 1990s Zimbabwe. The Modern Macro Theory (MMT) school of thought asserts that governments should provide spending to boost aggregate demand through money-financed spending until inflation begins to rise to an undesirable level, i.e. above an inflation target. However, to our minds there is one obvious problem with this school of thought in the current operational framework of most developed markets – interest on excess reserves (IoER).

Historically if a central bank wanted to create money it would print notes and mint coin. This created an income for the monetary authority, but without a related cost as cash does not pay interest. In the modern banking system, the creation of money is distinct from the creation of currency. Yet many consider quantitative easing (QE) to be synonymous with a return to the printing press and some to conclude that this is already the adoption of an MMT framework. While theoretically the creation of money and reserves are fungible, a key difference is that the authorities do pay interest on excess reserves. Hence, although monetary authorities are theoretically able to create as much 'money' as they want through the QE process, this is not seignorage in the traditional sense. In practice, QE is simply the issuance of an ultra-low duration debt instrument that is little different from more traditional forms of financing, for example T-bills. Hence, we do not consider QE in its current form to be an operation of debt monetisation, nor do we see this as an option open to the authorities[6].

Financial repression

Even if central banks did manage to reduce real interest rates through surprise inflation, in a world of capital mobility international investors would simply consider moving money overseas. That is unless first all countries (risk-adjusted) are in the same boat, which is broadly the case now. Or investors are prevented from transferring funds, or financial repression.

A combination of high inflation and financial repression saw relatively swift reductions in government debt levels after World War II. Indeed, a build-up of protectionism before and during the war meant that the subsequent introduction of Bretton Woods and the inclusion of capital controls that accompanied it was not a material shock to the global system. However, following a period of globalisation for both trade and capital in recent decades, the reintroduction of outright capital controls would have a major impact on the global financial system, global growth and government debt reduction plans.

However, a less overt form of repression avoids direct capital controls, but can nonetheless capture funds through regulatory requirements, inducements and incentives on investments. These could include, for example, regulatory requirements on pension funds, elevated capital charges on non-sovereign borrowing or (non-remunerated) minimum reserve ratios. Since the financial crisis, many similar measures have been added to the financial system with the motivation of macroprudential policy. These new measures do move in the same direction as financial repression. However, we do not consider either the current, or likely expected future outright level to be like the more repressive regime enacted after war.

What measures are most likely to reduce debt?

Our conclusion is that the monetary authorities have much less scope to reduce government debt than is popularly considered. We argue that interest rates are low as a function of structural factors of the global economy, including demographic factors, regulatory requirements and elevated risk aversion. This has resulted in low central bank policy rates – not the other way around.

We suggest that persistent excess inflation – even if achievable – would not reduce government debt levels as effectively as in the past. In part as government refinancing costs would rise, but in part because of foreign currency or inflation-linked debt in many authorities' portfolios. And unless this was

[6] One thought experiment is to consider whether central banks could simply announce that they would not pay interest on excess reserves. While technically possible, the central bank would then lose the ability to control short-term rates – and hence conduct monetary policy – until it withdrew the excess reserves from the monetary system.

conducted in a coordinated fashion, this would quickly result in capital flight, without financial repression to prevent it. While we recognise that recent macroprudential control and some regulatory requirements are moving in that direction, the scale has not reached levels to facilitate significant debt reduction, nor do we expect them to.

Finally, while we suggest that central banks do not have the freedom to print money in the ways that would materially finance the scale of debt we see today – drawing a sharp distinction between QE – and the creation of excess reserves remunerated at IoER rates – and money, with no interest.

As such, we conclude that governments will have to rely on more plain vanilla approaches to reduce debt levels. Growth enhancing policies that spur investment and productivity, reduce inequalities and bolster competition can help reduce debt as a proportion of GDP.

These are likely to have to be balanced with fiscal consolidation. This does not argue for a premature tightening of fiscal policy before the recovery is underway and when fiscal multipliers are high – we characterise that as a mistake after the 2008/2009 global financial crisis. However, it does argue for a rise in taxation relative to government spending over the longer term.

Moreover, and more in the context of addressing income inequality, we would argue that governments need to consider the supply-side arguments for persistently lower tax levels, forcing consolidation into an austerity on spending. Examples of US tax reduction – beyond President Trump's ill-timed handout in 2018 – have not delivered convincing evidence of the trickle-down effect that was supposed to follow. Rather, the long-term history of government debt shows a marked ratcheting higher of government debt following successive waves of tax reduction. Governments should therefore approach the prospect of tax and spend policies with fresh eyes, considering the benefits of balanced budget multipliers, particularly as economies exhibit spare capacity. Moreover, future taxation may be used to shape consumption patterns in other welfare advancing means, including carbon and sugar taxation.

This is to suggest that governments across the world will not be able to wave magic wands to reduce their levels of indebtedness. The process of debt reduction is likely to be more straightforward, but more protracted. If historic primary balances have reached fatigue levels much above 3% and we are wary that interest rates could revert to more familiar levels exceeding growth over the longer term, then material government debt reductions are likely to be measured in decades and not years. However, we also believe that a disciplined approach could deliver debt back to less elevated levels – around 70% of GDP – in 20 years. And on a more optimistic note this process of fiscal consolidation could prove an opportunity to deliver welfare-enhancing measures.

Appendix A – Derivation of government debt – a basic mathematical overview

The basic government budget constraint

$G_t + (1+r_t)\, D_{t-1} = T_t + D_t$ where G_t = government spending r_t = interest on debt
D_t = debt T_t = taxation

$P_t \equiv G_t - T_t$ P_t = primary balance

$D_t = (1+r_t)\, D_{t-1} + P_t$

as a % of GDP:

$d_t = \left(\frac{1+r_t}{1+\theta_t}\right) d_{t-1} + p_t$ where d_t = debt as a % GDP θ = nominal growth
p_t = primary balance as a % GDP

Looking forward in time, if

$d_t = R_t\, d_{t-1} + p_t$ where $R_t = (\frac{1+r_t}{1+\theta_t})$

$d_{t+1} = R_{t+1} d_t + p_{t+1}$

$d_t = \frac{1}{R_{t+1}} d_{t+1} - \frac{1}{R_{t+1}} p_{t+1}$

At the end of time (t+1) government must be left with no debt, $d_{t+1} = 0$, (for end of time (t+n) see footnote[7]). Hence, **future primary deficits must be offset by the present value of primary surpluses**

1. $d_t = -\frac{1}{R_{t+1}}\, p_{t+1}$

A 'steady state' for government debt, d*, is given by

$d_t - d_{t-1} = \Gamma_t d_{t-1} - P_t$ where $\Gamma_t = \frac{r_t - \theta_t}{1+\theta_t}$

$p_t = K + \lambda p_{t-1} + \rho d_{t-1}$ where K = constant λ = persistence of deficit
ρ = government reaction to change in debt

$d^* - d^* = \Gamma^* d^* - p^*$ where * represents the steady state

$p^* = K + \lambda p^* + \rho d^*$

2. $d^* = \frac{-K}{\rho - \Gamma_t^* (1-\lambda)}$

3. A debt limit, d**, exists if there is a maximum surplus, $\bar{\boldsymbol{p}}$, where $\boldsymbol{p}^* > \bar{\boldsymbol{p}}$. We describe this 'maximum' primary surplus as a point of fiscal fatigue. This then defines the debt limit as

$$d^{**} = \frac{\bar{p}}{\Gamma_t^*}$$

[7] Footnote, fuller expression of multi-period, n, limit of government debt, which must still equal 0.

$$d_t = -\sum_{j=1}^{\infty} \prod_{h=1}^{j} \frac{1}{R_{t+1}} d_{t+T} = 0$$

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